Fe

Instruction Manual

MICRO CONTROLLER X COMMUNICATION FUNCTIONS (RS-485 MODBUS)

TYPE : PXR

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CONTENTS

1. COMMUNICATION FUNCTIONS

1.1 General

・ PXR provides a communication function by RS-485 interface, by which it can transmit and receive data to and from host computer, programmable controller, graphic display panel, etc.

・ The communication system consists of master station and slave stations.　Up to 31 slave stations (PXR) can be connected per master station.
Note that, because the master station can communicate with only one slave station at a time, a party to communicate with must be specified by the "Station No." set at each slave station.

・ In order that the master station and slave station can communicate, the format of the transmit/receive data must coincide.　For the PXR, the format of the communication data is determined by the MODBUS protocol.

・ Please use an RS-232C ⇔ RS-485 converter in case of designating a personal computer or other devices which have an RS-232C interface as a master station.
〔RS-232C ⇔ RS-485 converter〕　(recommended article)
　　　Type: KS-485 (non-isolated type)/SYSTEM SACOM Corp.
　　　Type: SI-30A (isolated type)/SEKISUI ELECTRONICS Co., Ltd.
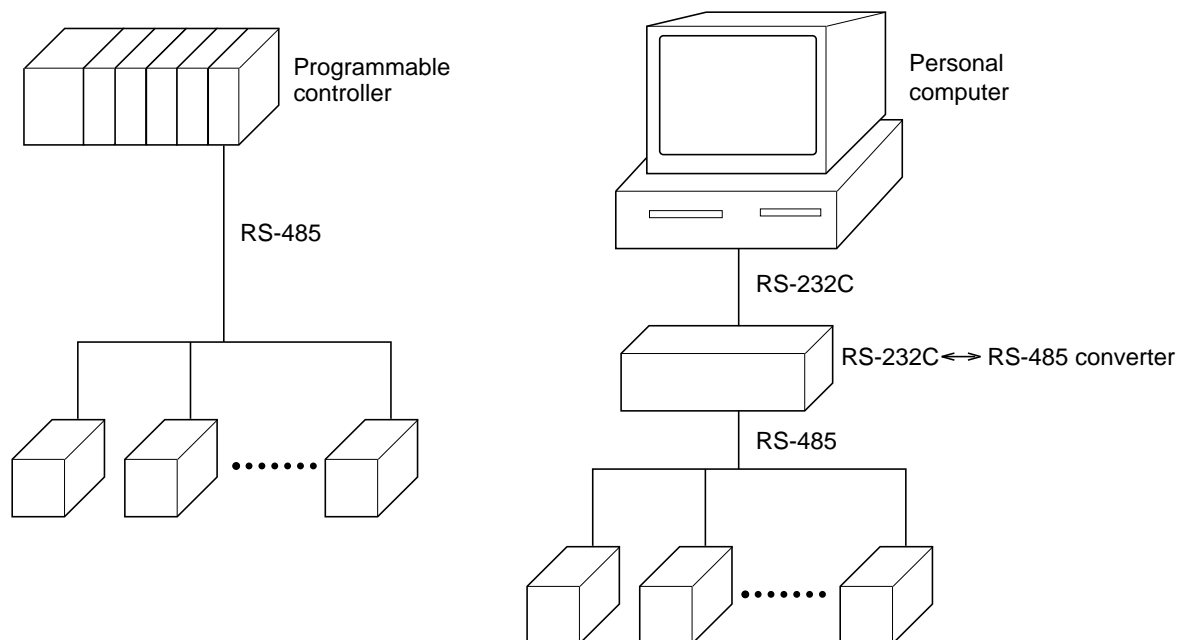
[Note] MODBUS® is the registered trade mark of Gould Modicon.
Caution:
　　When using the RS-232C ⇔ RS-485 converter, pay attention to cable connection between the converter and master station.　If the cable is not connected correctly, the master station and slave station cannot communicate. In addition, be careful about communication settings such as baud rate and parity set for the converter.

2. SPECIFICATIONS

2.1 Communication Specifications

Item	Specification	
Electrical specification	Based on EIA RS-485	
Transmission system	2-wire, semi-duplicate	
Synchronizing system	Start-stop synchronous system	
Connection format	1 : N	
Number connectable units	Up to 31 units	
Transmission distance	500m max. (total extension distance)	
Transmission speed	9600bps	
Data format	Data length	8 bits
	Stop bit	1 bit
	Parity	none, even, odd (selectable)
Transmission code	HEX value (MODBUS RTU mode)	
Error detection	CRC-16	
Isolation	Functional isolation between transmission circuit and others (withstand voltage : 500V AC)	

3. CONNECTION

3.1 Communication Terminal Allocation

PXR3

Terminal number	⑮	⑭
Signal name	RS485 ⊕	RS485 ⊖

PXR4

Terminal number	⑦	⑧
Signal name	RS485 ⊕	RS485 ⊖

PXR5，PXR9

Terminal number	①	②
Signal name	RS485 ⊕	RS485 ⊖

3.2 Wiring

・Use twisted pair cables with shield.

・The total extension length of the cable is up to 500 m.　A master station and up to 31 units of the PXR can be connected per line.

・Both ends of the cable should be terminate with terminating resistors 100Ω（1/2W or more).

・The shield wire of the cable should be grounded at one place on the master station unit side.

・If the PXR is to be installed where the level of noise applied to the PXR may exceed 1000 V, it is recommended to install a noise filter in the master station side as below.

　　　Recommended noise filter: ZRAC2203-11/TDK
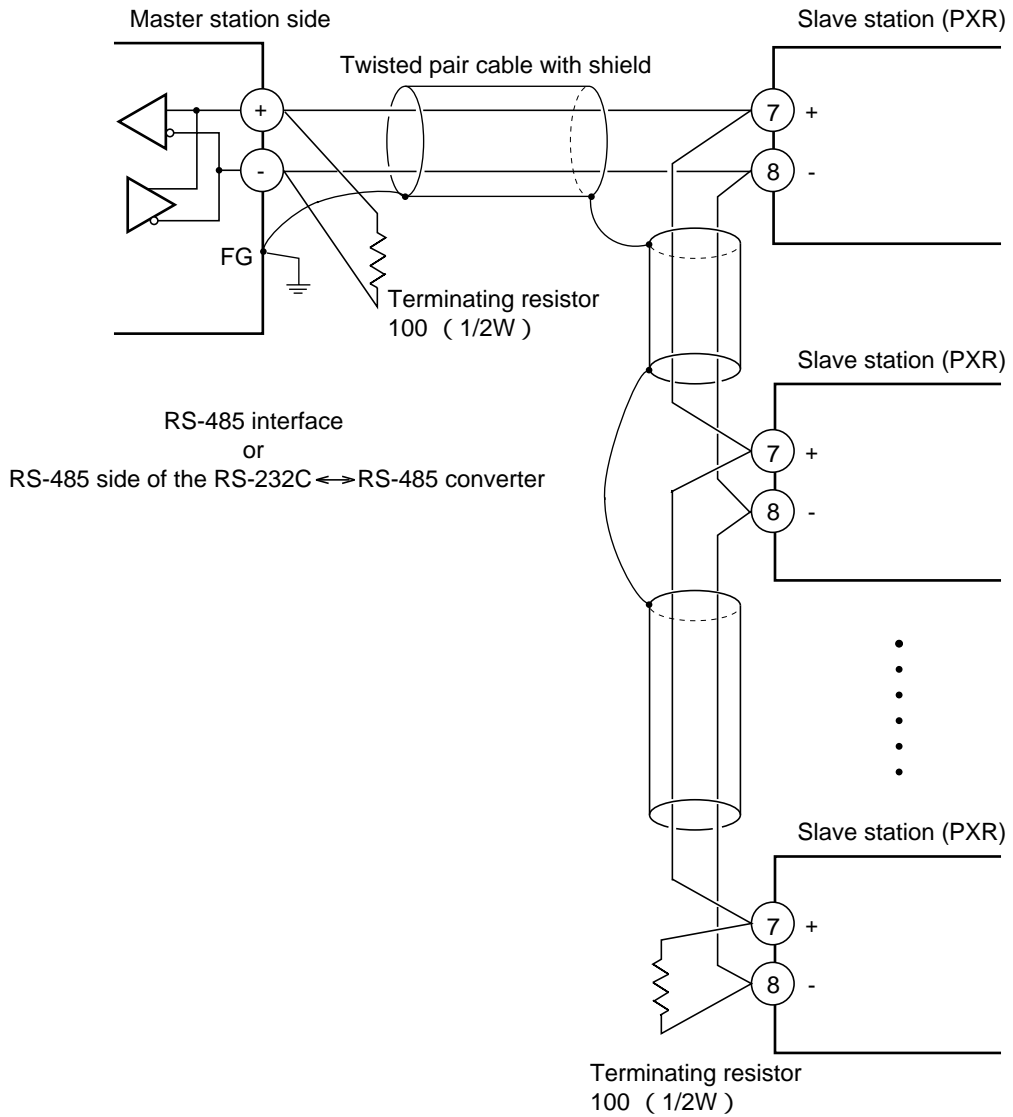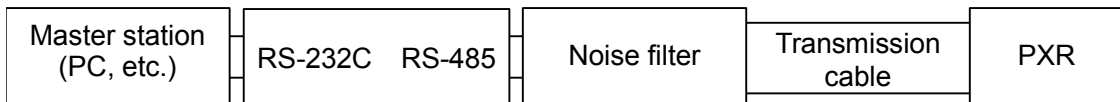
4. SETTING OF COMMUNICATION CONDITION

In order that the master station and instrument (PXR) can correctly communicate, following settings are required.

・All communication condition settings of the master station are the same as those of instruments (PXR).

・All instruments (PXR) connected on a line are set to "Station Nos. (STno)" which are different from each other.   (Any "Station No." is not shared by more than one instrument.)

4.1　Set Items

The parameters to be set are shown in the following table.   Set them by operating the front panel keys.

Parameter symbol	Item	Value at delivery	Setting range	Remarks
―――	Transmission speed	9600bps	Fixed (can not be changed)	Set the same communication condition to the master station and all slave stations.
―――	Data length	8 bits	Fixed (can not be changed)	
―――	Stop bit	1 bit	Fixed (can not be changed)	
CoM	Parity setting	0	0: odd parity 1: even parity 2: none parity	
STno	Station No.	1	0 to 255 (0:communication function stop)	Set a different value to each station.
PCoL	Communication protocol	As specified in order	0: Z-ASCII 1: Modbus	Set the parameter to "1". (The parameter is not displayed depending on models).

4.2   Setting Operation Method

The following example shows how to set the communication conditions.

Example: Selecting an even parity and "STno=18" on a station.

Key operation	Indication	Description
	200 200	Running state (PV/SV indication)
SEL (6 seconds)	P-n1 0	Press the SEL key for approximately 6 seconds. P-n1 appears and No. 3 block parameter is selected.
∨	STno 0	Operate the ∨ key repeatedly until STno parameter appears. (If past over, operate the ∧ key to return.)
SEL	STno 0	Press the SEL key. The numeric value on the lower indicator blinks and the setting mode is selected.
∧∨	STno 18	Operate the ∧ or ∨ key to change the numeric value to 18.
SEL	STno 18	Press the SEL key again. The numeric value stops blinking and the setting is registered.
∨	CoM 0	Press the ∨ key to display the CoM parameter.
SEL	CoM 0	Press the SEL key. The numeric value on the lower indicator blinks and the setting mode is selected.
∧∨	CoM 1	Operate the ∧ or ∨ key until the numeric value changes to 1 (even parity).
SEL	CoM 1	Press the SEL key again. The numeric value stops blinking and the setting is registered.
∨	PCoL 1	Press the ∨ key to display the PCoL parameter. Make sure that the set value is set to "1". (If the set value is set to another one, set it to "1").
SEL (3 seconds)	200 200	Press the SEL key for 3 seconds to resume the running indication (PV/SV indication).

5. MODBUS COMMUNICATION PROTOCOL

5.1 General

The communication system by the MODBUS protocol is that the communication is always started from the master station and a slave station responds to the received message.

Transmission procedures is as shown below.

1） The master station sends a command message to a slave station.

2） The slave station checks that the station No. in the received message matches with the own station No. or not.

3） If matched, the slave station executes the command and sends back the response message.

4） If mismatched, the slave station leaves the command message and wait for the next command message.

    a) In case when the station No. in the received command message matches with the own slave station No.

Master to slave	Command message		Data on
Slave to master		Response message	the line
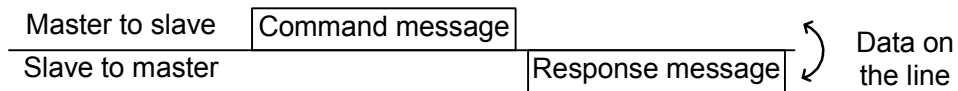
    b) In case when the station No. in the received command message mismatches with the own slave station No.

Master to slave	Command message		Data on
Slave to master		(Not respond)	the line
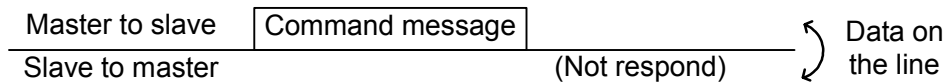
The master station can individually communicate with any one of slave stations connected on the same line upon setting the station No. in the command message.

5.2 Composition of Message

Command message and response message consist of 4 fields ; Station No., Function code, Data and Error check code.   And these are send in this order.

Station No. (1 byte)
Function code (1 byte)
Data (2 to 125 bytes)
Error check code (CRC-16) (2 bytes)

Fig. 5-1   Composition of message

In the following, each field is explained.

(1) Station No

Station No. is the number specifiing a slave station.   The command message is received and operated only by the slave station whose station No. matches with the No. set in the parameter "STno".
For details of setting the parameter "STno", refer to chapter 4.

(2) Function code

This is a code to designate the function executed at a slave station.
For details, refer to section 5.4.

(3) Data

Data are the data required for executing function codes.   The composition of data varies with function codes. For details, refer to chapter 6.
A coil number or a register number is assigned to each data in the temperature controller.   For reading/writing the data by communication, designate the coil number or register number.
Note that the coil number or register number transmitted on message is expressed as its relative address.
The relative address is calculated by the following expression.

$$\boxed{\text{Relateve address}} = \left(\text{The lower 4 digits of the } \boxed{\text{Coil number or register number}} \right) - 1$$

For example, when the resister number designated by a function code is 40003,

Relative address = (lower 4 digits of 40003) – 1

= 0002

is used on the message.

(4)　Error check code

This is the code to detect message errors (change in bit) in the signal transmission.
On the MODUBUS protocol (RTU mode), CRC-16 (Cycric Redundancy Check) is applied.
For CRC calculation method, refer to section 5.5.

5.3 Response of Slave Station

(1) Response for normal command

To a relevant message, the slave station creates and sends back a response message which corresponds to the command message. The composition of message in this case is the same as in section 5.2.
Contents of the data field depend on the function code. For details, refer to Chapter 6.

(2) Response for abnormal command

If contents of a command message have an abnormality (for example, non-actual function code is designated) other than transmission error, the slave station does not execute that command but creates and sends back a response message at error detection.
The composition of response message at error detection is as shown in Fig. 5-2 The value used for function code field is function code of command message plus 80_H.
Table 5-1 gives error codes.

Station No.
Function code + 80_H
Error code
Error check（CRC-16）

Fig. 5-2　Response message at error detection

Table 5-1　Error Code

Error code	Contents	Description
01H	Illegal function	Non-actual function code is designated. Check for the function code.
02H	Illegal data address	A relative address of a coil number or resister number to which the designated function code can not be used.
03H	Illegal data value	Because the designation of number is too much, the area where coil numbers or resister numbers do not exist is designated.

(3) No response

Under any of the following items, the slave station takes no action of the command message and sends back no response.

・A station number transmitted in the command message differs from the station number specified to the slave station.
・A error check code is not matched, or a transmission error (parity error, etc.) is detected.
・The time interval between the composition data of the message becomes longer than the time corresponding to 24 bits. (Refer to section 5.6 Transmission Control Procedure)
・Station No. of a slave station is set to 0.

5.4 Function Code

According to MODBUS protocol, coil numbers and register numbers are assigned by function codes.
Each function code acts on specific coil number and register number.
This correspondence is shown in Table5-2, and the message length by function is shown in Table5-3.

Table5-2　Correspondence between function codes and objective address

Function code				Coil No. and resister No.	
No.	Function	Object		No.	Contents
01_H	Read-out (continuously)	Coil		0xxxx	Read-out/write-in　bit data
02_H	Read-out (continuously)	Input relay		1xxxx	Read-out　bit data
03_H	Read-out (continuously)	Holding register		4xxxx	Read-out/write-in　word data
04_H	Read-out (continuously)	Input register		3xxxx	Read-out　word data
05_H	Write-in	Coil		0xxxx	Read-out/write-in　bit data
06_H	Write-in	Holding register		4xxxx	Read-out/write-in　word data
10_H	Write-in (continuously)	Holding register		4xxxx	Read-out/write-in　word data

Table5-3　Function code and message length

[Unit:byte]

Function code	Contents	Number of designatable data	Command message		Response message	
			Minimum	Maximum	Minimum	Maximum
01_H	Read-out of bit data	1 bit[*1]	8	8	6	6
02_H	Read-out of bit data (read-out only)	8 bits[*1]	8	8	6	6
03_H	Read-out of word data	60 words[*1]	8	8	7	125
04_H	Read-out of word data (read-out only)	37 words[*1]	8	8	7	79
05_H	Write-in of bit data	1 bit	8	8	8	8
06_H	Write-in of word data	1 words	8	8	8	8
10_H	Write-in of continuous word data	60 words[*1]	11	129	8	8

*1)　The "Number of designatable data" given above is the limit due to the number of data which the instrument assigns to coil number and register number (except function codes 05_H, 06_H).

5.5 Calculation of Error Check Code (CRC-16)

CRC-16 is the 2-byte (16-bits) error check code. From the top of the message (station No.) to the end of the data field are calculated.

The slave station calculates the CRC of the received message, and does not respond if the calculated CRC is different from the contents of the received CRC code.

Fig. 5-3 shows the flow of the CRC-16 calculation system.

```
                          ┌──────────────────┐
                          │      Start       │
                          └──────────────────┘
                                  │
         ┌────────────────────────────────────────┐
         │ Set FFFF_H (hexadecimal number) in CR.  │
         └────────────────────────────────────────┘
                                  │
                          ┌──────────────────┐
                          │    Set 1 in I.   │
                          └──────────────────┘
```

Explanation of variables
  CR : CRC error check data (2 bytes)
    I : Digits of calculation characters in command message
    J : Check on the number of times of CR calculation

Exclusive logical sum (XOR) is executed with CR and one character (1 byte) of the I characters, and its results is set in CR.

Set 1 in J.

Bit at right end of CR is 1?   NO

YES

Shift CR to right by 1 bit, and A001_H and exclusive logical sum (XOR) are executed and its result is set in CR.

Shift CR to right by 1 bit.

Add 1 to J.

Calculation (8 times) is finished?
J>8   NO

YES

Add 1 to I.

Calculation of all characters is completed?
I>All characters   NO

YES

End

(Calculation is executed in the order of command message station No., function code and data.)

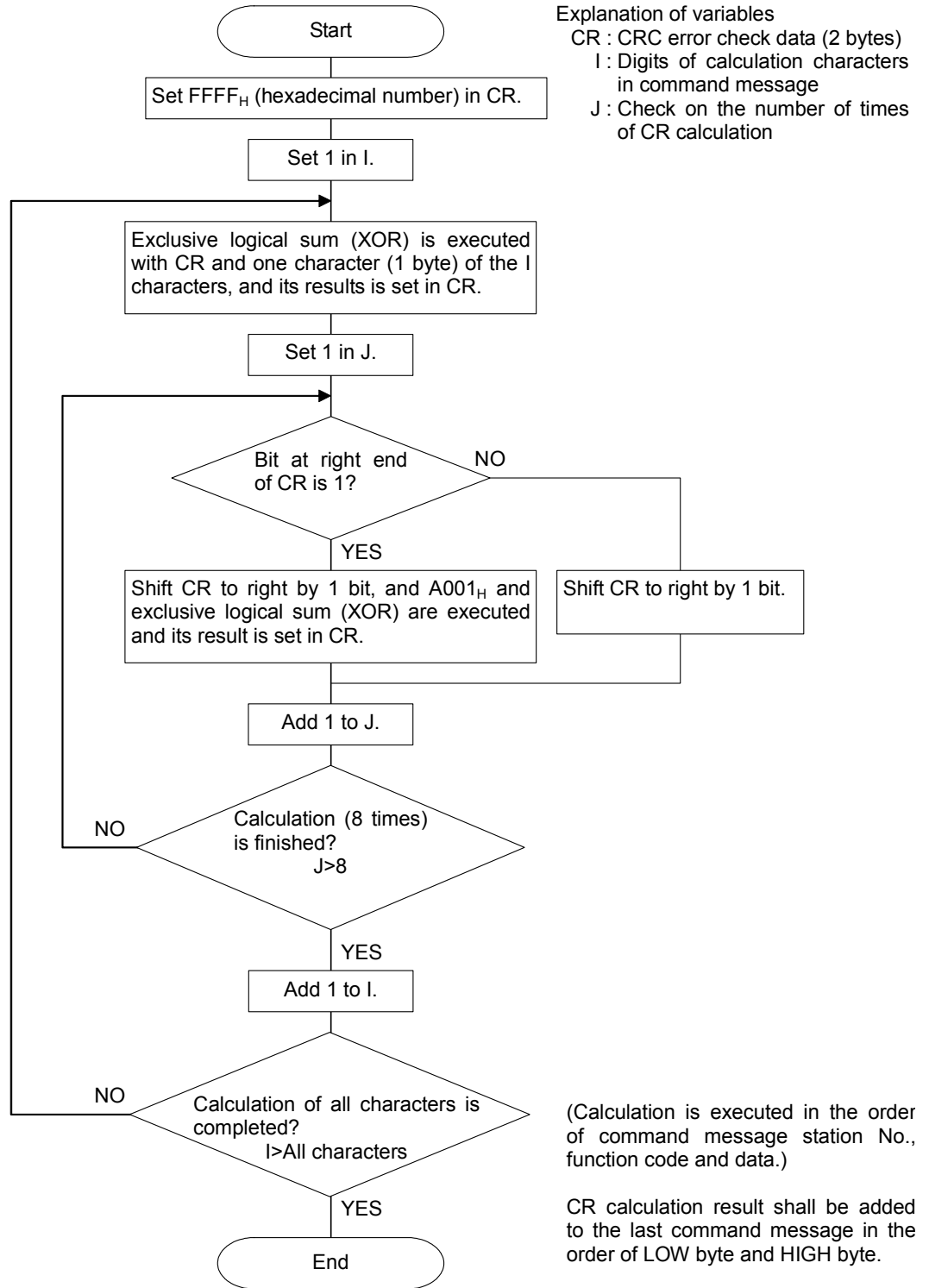CR calculation result shall be added to the last command message in the order of LOW byte and HIGH byte.

Fig. 5-3　Flow of CRC-16 calculation

5.6 Transmission Control Procedure

(1) Transmission procedure of master station

The master station must proceed to a communication upon conforming to the following items.

(1-1) Before sending a command message, provide 48 bits time or more vacant status.

(1-2) For sending, the interval between bytes of a command message is below 24 bits time.

(1-3) Within 24 bits time after sending a command message, the receiving status is posted.

(1-4) Provide 48 bits time or more vacant status between the end of response message reception and beginning of next command message sending [same as in (1-1)].

(1-5) For ensuring the safety, make a confirmation of the response message and make an arrangement so as to provide 3 or more retries in case of no response, error occurrence, etc.

Note) The above definition is for most unfavorable value. For ensuring the safety, it's recommended the program of the master to work with safety factors of 2 to 3. Concretely, it is advised to arrange the program for 9600 bps with 10 ms or more for vacant status (1-1), and within 1 ms for byte interval (1-2) and changeover from sending to receiving (1-3).

(2) Description

1) Detection of the message frame

Since the communication system uses the 2-wire RS-485 interface, there may be 2 statuses on a line below.

(a) Vacant status (no data on line)

(b) Communication status (data is existing)

Instruments connected on the line are initially at a receiving status and monitoring the line. When 24 bits time or more vacant status has appeared on the line, the end of preceding frame is assumed and, within following 24 bits time, a receiving status is posted. When data appears on the line, instruments receive it while 24 bits time or more vacant status is detected again, and the end of that frame is assumed. I.e., data which appeared on the line from the first 24 bits time or more vacant status to the next 24 bits time or more vacant status is fetched as one frame.

Therefore, one frame (command message) must be sent upon confirming the following.

(1-1) 48 bits time or more vacant status precedes the command message sending.

(1-2) Interval between bytes of 1 command message is smaller than 24 bits time.

2) Response of this instrument (PXR)

After a frame detection (24 bits time or more vacant status), this instrument carries out processing with that frame as a command message. If the command message is destined to the own station, a response message is returned. Its processing time is 1 to 30 ms (depends on contents of command message).

After sending a command message, therefore, the master station must observe the following

(1-3) Receiving status is posted within 24 bits time after sending a command message.

Space time of longer than 5ms is needed.
(longer than 10ms is recommended.)

| Controll station → PXR | | POL1 | | | POL2 | |

1 to 30msec

| Controll station ← PXR | | | POL1 response data | |

| Data on line | | POL1 | | POL1 response data | | POL2 | |
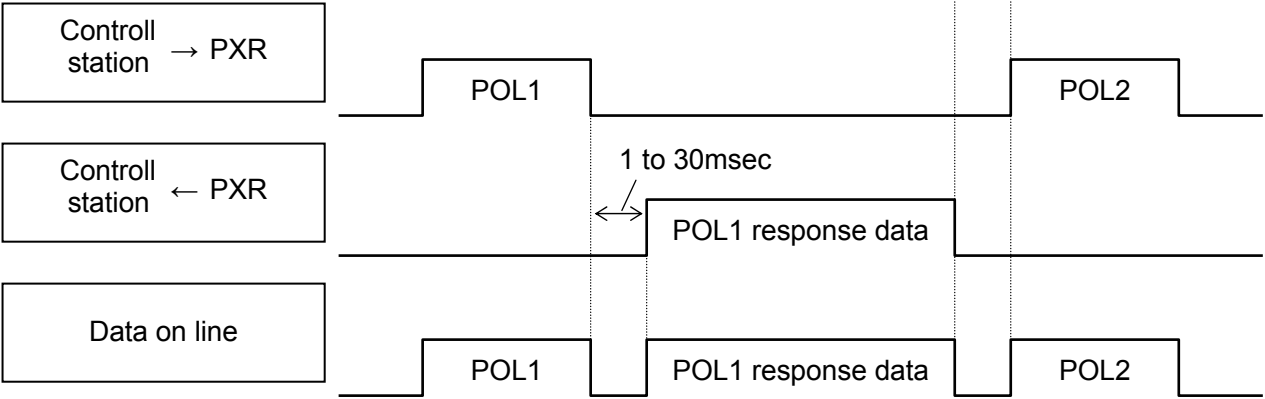
5.7 Precautions when Writing Data

PXR contains internal nonvolatile memory (EEPROM) that is used to save the setting parameters. The data written to the nonvolatile memory (EEPROM) remains even after the power for PXR is turned off. Parameters that are written via communication are automatically saved in the internal nonvolatile memory (EEPROM). However, please note that there are two limitations as follows.

Caution:
1. There is a limit to the number of times that data can be transferred to the nonvolatile memory (EEPROM) (100,000 times). Data cannot be guaranteed if written more than 100,000 times.
    Be careful not to transfer unnecessary data when writing data via communication.
    In particular, when constructing a communication system with master POD (such as a touch panel), make sure that the POD writing and trigger settings are appropriate.
    Avoid writing at fixed cycles.

2. Writing to the nonvolatile memory (EEPROM) takes several milliseconds. If the power for PXR is turned off during this operation, the data saved to the nonvolatile memory (EEPROM) may be corrupted.
    Wait several seconds after writing data before turning off the power.
    In particular, when writing data in a cycle from master device, there is a greater danger of the writing timing and power shutoff timing coinciding.
    Avoid writing at fixed cycles.

6. DETAILS OF MESSAGE

6.1 Read-out of Bit Data 〔Function code:01$_H$〕

Function code	Max. bit number read-out in one message	Relative data address	Coil number
01$_H$	1 bit	0000$_H$	00001

(1) Message composition

Command message composition (byte)

Station No.	
Function code	
Read-out start No. (relative address)	00$_H$
	00$_H$
Read-out bit number	00$_H$
	01$_H$
CRC data	Upper
	Lower

Response message composition (byte)

Station No.	
Function code	
	01$_H$
State of the first 8 bits	
CRC data	Upper
	Lower

* Arrangement of read-out bit data

MSB   LSB

0	0	0	0	0	0	0	

└── State of read-out bit
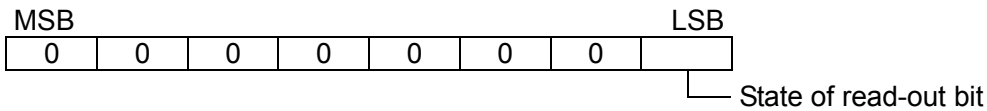
(2) Function explanations

The state of the bit of the coil No. 00001 is read-out.

(3) Message transmission (example)

The following shows an example of reading-out the FIX execution request data from No. 1 slave station.

FIX execution request bit   Relative address : 0000$_H$ Number of data : 01$_H$

Command message composition (byte)

Station No.		01$_H$
Function code		01$_H$
Read-out start No. (relative address)	Upper	00$_H$
	Lower	00$_H$
Read-out bit number	Upper	00$_H$
	Lower	01$_H$
CRC data	Upper	FD$_H$
	Lower	CA$_H$

Response message composition (byte)

Station No.		01$_H$
Function code		01$_H$
Read-out byte number		01$_H$
State of the first 8 bits		00$_H$
CRC data	Upper	51$_H$
	Lower	88$_H$

* Meaning of read data

MSB   LSB

State of FIX execution request   00$_H$=

0	0	0	0	0	0	0	0

↑
No execution of FIX
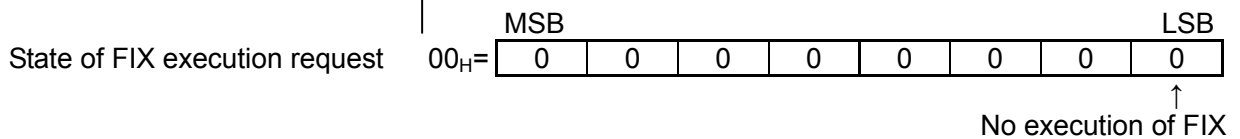
6.2 Read-out of Read-out Only Bit Data [Function code:02$_H$]

Function code	Max. bit number read-out in one message	Relative data address	Coil number
02$_H$	8 bits	0000$_H$ to 000F$_H$	10001 to 10016

(1) Message composition

Command message composition (byte)

Station No.		
Function code		
Read-out start No. (relative address)	Upper	
	Lower	
Read-out bit number	00$_H$	01$_H$ to 08$_H$
	Lower	
CRC data	Upper	
	Lower	

Response message composition (byte)

Station No.	
Function code	
01$_H$	
State of the read-out bit	
CRC data	Upper
	Lower

* Arrangement of read-out bit data

MSB   LSB

— State of the first 1 bit

— State of the last 1 bit

(2) Function explanations

Bit information data of continuous read-out bit number from the read-out start number.

Read-out bit data are arranged in 8-bit unit and transmitted from the slave station.

When read-out bit data number is not multiple of 8, all the bits (MSB side) not related with the state of the last 8 bits will become "0".

(3) Message transmission (example)

The following shows an example of reading-out the state of the alarm 1 and alarm 2 transmitted from No.31 slave station.

Alarm 1 detect data bit   Relative address : $000C_H$ Data number : 02_H

Alarm 2 detect data bit   Relative address : $000D_H$

Command message composition (byte)

Station No.		$1F_H$
Function code		02_H
Read-out start No. (relative address)	Upper	00_H
	Lower	$0C_H$
Read-out bit number	Upper	00_H
	Lower	02_H
CRC data	Upper	$3A_H$
	Lower	76_H

Response message composition (byte)

Station No.		$1F_H$
Function code		02_H
Read-out byte number		01_H
State of the first 8 bits		01_H
CRC data	Upper	66_H
	Lower	60_H

*   Meaning of read-out data

State of alarm detection of alarms 1 and 2 (State of the first 2 bits)

MSB   LSB

$01_H=$

0	0	0	0	0	0	0	1

Alarm 2 OFF state

Alarm 1 ON state
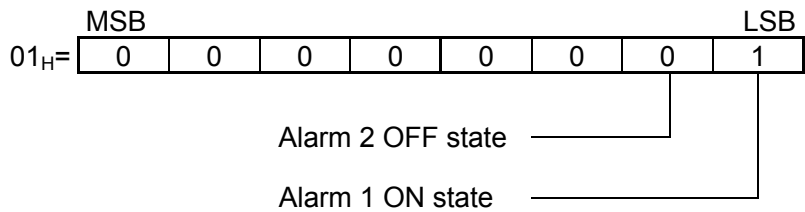
6.3 Read-out of Word Data [Function code:03$_H$]

Function code	Max. word number read-out in one message	Relative data address	Register No.	Kind of data
03$_H$	60 words	0000$_H$－0077$_H$	40001－40120	Internal calculation value
		03E8$_H$－045F$_H$	41001－41120	Engineering unit

(1) Message composition

Command message composition (byte)

Station No.	
Function code	
Read-out start No. (relative address)	Upper
	Lower
Read-out word number	Upper
	Lower
CRC data	Upper
	Lower

} 1 to 60

Response message composition (byte)

Station No.	
Function code	
Read-out byte number	Read-out word number×2
Contents of the first word data	Upper
	Lower
Contents of the next word data	Upper
	Lower
~	~
Contents of the last word data	Upper
	Lower
CRC data	Upper
	Lower

* Arrangement of read-out word data

MSB   LSB

Upper byte of contents of the first word data
Lower byte of contents of the first word data
Upper byte of contents of the next word data
Lower byte of contents of the next word data
~
Upper byte of contents of the last word data
Lower byte of contents of the last word data

(2) Function explanations

Word data of continuous word numbers from the read-out start No. can be read.   Read-out word data are transmitted from the slave station in the order of upper and lower bytes.

(3) Message transmission

(a) In case of data of internal calculation value

The following shows an example of reading the low and high limits of set value from No. 2 slave station.

Relative address of low limit of set value : $001E_H$　　　　Data number : 02_H

Command message composition (byte)

Station No.		02_H
Function code		03_H
Read-out start No.	Upper	00_H
(relative address)	Lower	$1E_H$
Read-out word	Upper	00_H
number	Lower	02_H
CRC data	Upper	$A4_H$
	Lower	$3E_H$

Response message composition (byte)

Station No.		02_H
Function code		03_H
Read-out byte number		04_H
Contents of the	Upper	00_H
first word data	Lower	00_H
Contents of the	Upper	27_H
next word data	Lower	10_H
CRC data	Upper	$D3_H$
	Lower	$0F_H$

* Meaning of read-out data

　Low limit of set value　　　　　　00　00_H　=　　　0 (=　0.00%FS)

　　(contents of first word data)

　High limit of set value　　　　　　27　10_H　=　10000 (=100.00%FS)

　　(contents of next word data)

When input range is 0 to 400 ºC,

　Low limit of set value =　　0ºC (=　0.00%FS)

　High limit of set value = 400ºC (=100.00%FS)
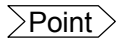
> ⟩Point⟩ For handling of the internal calculation value, engineering unit and decimal point, refer to section 7.1.

(b) In case of data of engineering unit

The following shows an example of reading the low and high limits of set value from No. 2 slave station.

Relative address of low limit set value : 0406 $_H$ Data number : 02$_H$

Command message composition (byte)

Station No.		02$_H$
Function code		03$_H$
Read-out start No. (relative address)	Upper	04$_H$
	Lower	06$_H$
Read-out word number	Upper	00$_H$
	Lower	02$_H$
CRC data	Upper	25$_H$
	Lower	09$_H$

Response message composition (byte)

Station No.		02$_H$
Function code		03$_H$
Read-out byte number		04$_H$
Contents of the first word data	Upper	0$_H$
	Lower	0$_H$
Contents of the next word data	Upper	01$_H$
	Lower	90$_H$
CRC data	Upper	C8$_H$
	Lower	CF$_H$

* Meaning of read-out data

Low limit of set value   00   00$_H$ =   0
(contents of first word data)

High limit of set value   01   90$_H$ = 400
(contents of next word data)

When the position of decimal point is 0,

Low limit of set value = 0℃

High limit of set value =400℃

> Point For handling of the internal calculation value, engineering unit and decimal point, refer to section 7.1.

6.4 Read-out of Read-out Only Word Data [Function code:04$_H$]

Function code	Max. word number read-out in one message	Relative data address	Register No.	Kind of data
04$_H$	37 words	0000$_H$－0024$_H$	30001－30037	Internal calculation value
		03E8$_H$－040C$_H$	31001－31037	Engineering unit

(1) Message composition

Command message composition (byte)

Station No.	
Function code	
Read-out start No. (relative address)	Upper
	Lower
Read-out word number	Upper
	Lower
CRC data	Upper
	Lower

} 1 to 15

Response message composition (byte)

Station No.	
Function code	
Read-out byte number	
Contents of the first word data	Upper
	Lower
Contents of the next word data	Upper
	Lower
~	~
Contents of the last word data	Upper
	Lower
CRC data	Upper
	Lower

Read-out word number×2

*   Arrangement of read-out word data

MSB   LSB

Upper byte of contents of the first word data
Lower byte of contents of the first word data
Upper byte of contents of the next word data
Lower byte of contents of the next word data
~
Upper byte of contents of the last word data
Lower byte of contents of the last word data

(2) Function explanations

Word data of continuous word numbers from the read-out start No. can be read. Read-out word data are transmitted from the slave station in the order of upper and lower bytes.

(3) Message transmission

(a) In case of data of internal calculation value

The following shows an example of reading-out the PV from No. 1 slave station.

Relative address of PV : 0000_H Data number : 01_H

Command message composition (byte)

Station No.		01_H
Function code		04_H
Read-out start No. (relative address)	Upper	00_H
	Lower	00_H
Read-out word number	Upper	00_H
	Lower	01_H
CRC data	Upper	31_H
	Lower	CA_H

Response message composition (byte)

Station No.		01_H
Function code		04_H
Read-out byte number		02_H
Contents of the first word data	Upper	03_H
	Lower	46_H
CRC data	Upper	38_H
	Lower	32_H

* Meaning of read-out data

Contents of the first word data   03 46_H = 838 (=8.38%FS)

When input range is 0 to 400ºC,

PV=33.5ºC (=8.38%FS×400)

└─── Input range

(b) In case of data of engineering unit

The following shows an example of reading-out the PV value from No. 1 slave station.

Relative address of PV value : $03E8_H$ Data number : 01_H

Command message composition (byte)

Station No.		01_H
Function code		04_H
Read-out start No. (relative address)	Upper	03_H
	Lower	$E8_H$
Read-out word number	Upper	00_H
	Lower	01_H
CRC data	Upper	$B1_H$
	Lower	BA_H

Response message composition (byte)

Station No.		01_H
Function code		04_H
Read-out byte number		02_H
Contents of the first word data	Upper	01_H
	Lower	$4F_H$
CRC data	Upper	38_H
	Lower	32_H

* Meaning of read-out data

Contents of the first word data   01 $4F_H$ = 335

When the position of decimal point is 1,

PV=33.5ºC (=33.5)

⟩Point⟩ For handling of the internal calculation value, engineering unit and decimal point, refer to section 7.1.

6.5 Write-in of Bit Data (1 bit) [Function code:05$_H$]

Function code	Max. bit number written-in one message	Relative data address	Coil No.
05$_H$	1 bit	0000$_H$	00001

(1) Message composition

Command message composition (byte)

Station No.		
Function code		
Write-in designate No. (relative address)	00$_H$	
	00$_H$	
State of write-in designation	Upper	0000$_H$=0
	Lower	FF00$_H$=1
CRC data	Upper	
	Lower	

Response message composition (byte)

Station No.		
Function code		
Write-in designate No. (relative address)	00$_H$	
	00$_H$	
State of write-in designation	Upper	0000$_H$=0
	Lower	FF00$_H$=1
CRC data	Upper	
	Lower	

(2) Function explanations

Data of "0" or "1" is written in a bit of write-in designation No. bit.   When "0" is written-in data of 0000$_H$ is transmitted, and when "1" is written-in, data of FF00$_H$ is transmitted.

(3) Message transmission (example:This is the method of FIX execution)

The following shows an example of FIX execution request to No. 1 slave station.

FIX execution request bit　　Relative address：0000$_H$

Command message composition (byte)

Station No.		01$_H$
Function code		05$_H$
Write-in designate No. (relative address)	Upper	00$_H$
	Lower	00$_H$
State of write-in designation	Upper	FF$_H$
	Lower	00$_H$
CRC data	Upper	8C$_H$
	Lower	3A$_H$

Response message composition (byte)

Station No.		01$_H$
Function code		05$_H$
Write-in designate No. (relative address)	Upper	00$_H$
	Lower	00$_H$
State of write-in designation	Upper	FF$_H$
	Lower	00$_H$
CRC data	Upper	8C$_H$
	Lower	3A$_H$

After receiving above command, it takes approximately 5s that PXR saves memory data from RAM to EEPROM.

Caution！

If you turn off the PXR during above saving (5s or less), memory data are broken and can not be used.

≻Point≻　For details of FIX processing, refer to section 5.7.

6.6 Write-in of Word Data (1 word) [Function code:06_H]

Function code	Max. word number write-in in one message	Relative data address	Register No.	Kind of data
06_H	1 word	$0000_H - 0077_H$	$40001 - 40120$	Internal calculation value
		$03E8_H - 045F_H$	$41001 - 41120$	Engineering unit

(1) Message composition

Command message composition (byte)

Station No.	
Function code	
Write-in designate No. (relative address)	Upper
	Lower
Write-in word data	Upper
	Lower
CRC data	Upper
	Lower

Response message composition (byte)

Station No.	
Function code	
Write-in designate No. (relative address)	Upper
	Lower
Write-in word data	Upper
	Lower
CRC data	Upper
	Lower

(2) Function explanation

Designated word data is written in write-in designate No. Write-in data are transmitted from master station in the order of upper and lower bytes.

(3) Message transmission (example)

The following shows an example of setting 100.0 ($10000 = C3E8_H$) to the parameter "P" of No.1 slave station.

Parameter "P"   Relative address: 0005_H (table of internal calculation unit)

(or $03ED_H$ (table of engineering value))

   * Parameter "P" is not in the engineering unit setting, the same value is written in both tables.

Command message composition (byte)

Station No.		01_H
Function code		06_H
Write-in designate No. (relative address)	Upper	00_H
	Lower	05_H
State of write-in designation	Upper	03_H
	Lower	$E8_H$
CRC data	Upper	99_H
	Lower	75_H

In case of interval calculation value

Response message composition (byte)

Station No.		01_H
Function code		06_H
Write-in designate No. (relative address)	Upper	00_H
	Lower	05_H
State of write-in designation	Upper	03_H
	Lower	$E8_H$
CRC data	Upper	99_H
	Lower	75_H

$\rangle$Point$\rangle$ For handling of the internal calculation value, engineering unit and decimal point, refer to section 7.1.
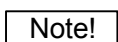
Note!   When setting is being locked, response is returned normally, but the command is not executed. Make sure that setting is not locked to send the write-in command.   If the write-in command message is sent to any slave station during the FIX process, response is not returned from it.

6.7　Write-in of Continuous Word Data [Function code:10$_H$]

Function code	Max. word number write-in in one message	Relative data address	Register No.	Kind of data
10$_H$	60 words	0000$_H$－0077$_H$	40001－40120	Internal calculation value
		03E8$_H$－045F$_H$	41001－41120	Engineering unit

(1)　Message composition

Command message composition (byte)

Station No.	
Function code	
Write-in start No. (relative address)	Upper
	Lower
Write-in word number	Upper
	Lower
Write-in byte number	
First write-in word data	Upper
	Lower
Next write-in word data	Upper
	Lower
~	~
Last write-in word data	Upper
	Lower
CRC data	Upper
	Lower

} 1 to 60

} Write-in word number×2

Response message composition (byte)

Station No.	
Function code	
Write-in start No. (relative address)	Upper
	Lower
Write-in word number	Upper
	Lower
CRC data	Upper
	Lower

*　Arrangement of write-in word data

MSB　　　　　　　　　　　　　　　　LSB

Upper byte of contents of the first word data
Lower byte of contents of the first word data
Upper byte of contents of the next word data
Lower byte of contents of the next word data
Upper byte of contents of the last word data
Lower byte of contents of the last word data

(2)　Function explanation

Word data of continuous word number is written from write-in start address.　Write-in word data are transmitted from master station in the order of upper and lower bytes.

(3) Message transmission (example)

The following shows an example of writing-in P=100.0, I=10, and D=5.0 to No. 1 slave station.

P=$03E8_H$ (=1000_D)

I=0064_H (=100_D)

D=0032_H (=50_D)

Parameter "P"   Relative address:0005_H Data number:03_H

Command message composition (byte)

Station No.		01_H
Function code		10_H
Write-in start No.	Upper	00_H
	Lower	05_H
Write-in word number	Upper	00_H
	Lower	03_H
Write-in byte number		06_H
First write-in word data	Upper	03_H
	Lower	$E8_H$
Next write-in word data	Upper	00_H
	Lower	64_H
Last write-in word data	Upper	00_H
	Lower	32_H
CRC data	Upper	56_H
	Lower	BE_H

Response message composition (byte)

Station No.		01_H
Function code		10_H
Write-in start No.	Upper	00_H
	Lower	05_H
Write-in word number	Upper	00_H
	Lower	03_H
CRC data	Upper	90_H
	Lower	09_H
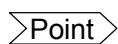
$\rangle$Point$\rangle$ Since the transmission data can not include a decimal point, data of 100.0 is transmitted as "1000".
For transmission format of each data, refer to the address map (Chapter7).
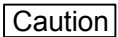
Caution When setting is being locked, response is returned normally.   However, the command is not executed.   If the write-in command message is sent to any slave station during the FIX process, response is not returned from it.

7. ADDRESS MAP AND DATA FORMAT

7.1 Data Format

7.1.1 Transmission data format

The MODBUS protocol used in this instrument (PXR) is RTU (Remote Terminal Unit) mode.
Transmitted data is "numeric value" and not "ASCII code".

7.1.2 Internal calculation value and engineering unit

This instrument can handle 2 kinds of set value data or other data which are affected by input range as follows.

   1) Internal calculation value : In % with respect to input range (0.00 to 100.00, without decimal point)

   2) Engineering unit   : Subjected to scaling to actual value according to input range

"Engineering unit" data can be handled with "Internal calculation value" address (register No.) plus 1,000

[Example] The value of "PV = 150" (input range: 0 to 400ºC)

	Register No.	Data (HEX)		Data (decimal)
Internal calculation value	30001	0EA6H	➡	3750 （37.50%）
Engineering uni	31001	0096H		150

    In case of "Internal calculation value" here,

        37.50 (%) $\times$ 400 (full scale) $=$ 150 （℃） is obtained.

Note that the same data is handled at both addresses if it is not affected by input range.
This handling does not apply to bit data. (Address increased by 1,000 is invalid.)
For data affected by input range, refer to address maps in Sections 7.2 and 7.3.

Note   : After changing the input range by communication write-in, pay attention to the decimal point position.
      After changing the decimal point position by communication write-in, simultaneously change the lower limit and upper limit of input range..

      Example : Input range 0 to 400 changed into 0.0 to 400.0
              a)   Face panel operation :   P-dP=0→1 suffices
              b)   Communication write-in :   P-dP=0→1
                                         P-SL=0→0   } must be performed.
                                           P-SU=400→4000

7.1.3 Handling of decimal point

Some internally stored data have more digits below decimal point than displayed on the face panel.

No decimal point is added to transmission data.

For data given in the following table, carry out an alignment of decimal point.

(a) Internal calculation value data (address map shown in Section 7.2)

Digits below point	Kind	Register No.
Designate by parameter [P-dP] (0 to 2)	Parameter [P-SL]	40018
	Parameter [P-SU]	40019
1 digit below point	Parameter [P]	40006
	Parameter [i]	40007
	Parameter [d]	40008
	Parameter [CooL]	40010
	Parameter [P-dF]	40022
	Parameter [HB]	40039
	Parameter [r-dF]	40120
	Parameter [CT]	30010
2 digits below point	Data affected by input range	See address map (Section 7.2)
	Parameter [dB]	40011
	Parameter [bAL]	40013
	Parameter [PLC1]	40025
	Parameter [PHC1]	40026
	Parameter [PLC2]	40027
	Parameter [PHC2]	40028
	Parameter [Ao-L]	40115
	Parameter [Ao-H]	40116
	Parameter [OUT1]	30004
	Parameter [OUT2]	30005

(b) Engineering unit (address map shown in Section 7.3)

Digits below point	Kind	Register No.
Designate by parameter [P-dP] (0 to 2)	Parameter [P-SL]	41018
	Parameter [P-SU]	41019
	Data affected by input range	See address map (Section 7.3)
1 digit below point	Parameter [P]	41006
	Parameter [i]	41007
	Parameter [d]	41008
	Parameter [CooL]	41010
	Parameter [P-dF]	41022
	Parameter [HB]	41039
	Parameter [r-dF]	40120
	Parameter [CT]	31010
2 digits below point	Parameter [dB]	41011
	Parameter [bAL]	41013
	Parameter [PLC1]	41025
	Parameter [PHC1]	41026
	Parameter [PLC2]	41027
	Parameter [PHC2]	41028
	Parameter [Ao-L]	40115
	Parameter [Ao-H]	40116
	Parameter [OUT1]	31004
	Parameter [OUT2]	31005

7.1.4 Data when input is abnormal

When "UUUU" or "LLLL" is displayed on the face panel on account of over-range, under-range or input open circuit for example,   PV read-out value is 105% or -5% of input range.

Presence of any input abnormality via communication can be detected by:

"Register No. 30008 (or 31008): Input/main unit abnormal status"

7.1.5 Range of write-in data

When data is written in each parameter, the write-in data should be kept within the setting range.   PXR accepts the write-in data beyond the range.   However, be careful since the PXR performance will not be guaranteed.

7.2 Address Map of Internal Calculation Value Data

Data affected by input range is handled in terms of internal value (0.00 to 100.00% value) before scaling.

For detailed contents about individual parameter function or setting range, refer to the operation manual (ECNO: 406).

Bit data [read-out/write-in] : Function code [01$_H$, 05$_H$]

Relative address	Coil No.	Type	Memory contents	Read-out data	Write-in data setting range	Affected by input range	Remarks or corresponding parameter
0000$_H$	00001	Bit	Write in non-volatile memory (FIX execution)	0: Not writing-in 1: Writing in memory	0: No request 1: Request to write in		(the same function as 40001)

Bit data [read-out only] : Function code [02$_H$]

Relative address	Coil No.	Type	Memory contents	Read-out data	Affected by input range	Remarks or corresponding parameter
0000$_H$	10001	Bit	Alarm 1 ON/OFF	0: Alarm 1 OFF, 1: Alarm 1 ON		
0001$_H$	10002		(Reserve)			
0002$_H$	10003		(Reserve)			
0003$_H$	10004		(Reserve)			
0004$_H$	10005	Bit	Alarm 2 ON/OFF	0: Alarm 2 OFF, 1: Alarm 2 ON		
0005$_H$	10006		(Reserve)			
0006$_H$	10007		(Reserve)			
0007$_H$	10008		(Reserve)			
0008$_H$	10009	Bit	Alarm 1 output (Calculation result of non-exciting alarm)	0: Relay output of alarm 1 OFF 1: Relay output of alarm 1 ON		
0009$_H$	10010	Bit	Alarm 2 output (Calculation result of non-exciting alarm)	0: Relay output of alarm 2 OFF 1: Relay output of alarm 2 ON		
000A$_H$	10011	Bit	Alarm 3 output (Calculation result of non-exciting alarm)	0: Relay output of alarm 3 OFF 1: Relay output of alarm 3 ON		
000B$_H$	10012	Bit	HB alarm relay output	0: HB alarm output OFF 1: HB alarm output ON		
000C$_H$	10013	Bit	Alarm 1 ON/OFF	0: Alarm 1 OFF, 1: Alarm 1 ON		(Same as 10001)
000D$_H$	10014	Bit	Alarm 2 ON/OFF	0: Alarm 2 OFF, 1: Alarm 2 ON		(Same as 10002)
000E$_H$	10015	Bit	Alarm 3 ON/OFF	0: Alarm 3 OFF, 1: Alarm 3 ON		
000F$_H$	10016	Bit	HB alarm relay output	0: HB alarm output OFF 1: HB alarm output ON		(Same as 10012)

Word data [read-out/write-in] : Function code [03ₕ, 06ₕ, 10ₕ]

Word data [read-out/write-in] : Function code [03$_H$, 06$_H$, 10$_H$]

Relative address	Register No.	Type	Memory contents	Read-out data	Write-in data setting range	Affected by input range	Remarks or corresponding parameter
0000$_H$	40001	Word	Non-volatile memory write-in	0: Not writing-in 1: Writing in memory	0:No request 1:Request to write in		(Same function as 00001)
0001$_H$	40002	Word	PID/FUZZY/SELF selection	0: PID control 1: FUZZYcontrol 2: SELF tuning control			CTrL * Inhibit change while controlling
0002$_H$	40003	Word	SV value set on face panel	0 to 10000 (within 0.00 to 100.00% FS within set value limits)		*	
0003$_H$	40004	Word	Control RUN/standby	0: Invalidate standby (RUN) 1: Validate standby			STby
0004$_H$	40005	Word	Auto tuning command	0: Auto tuning disabled 1: While executing standard type AT executed 2: While executing low PV type AT executed	0: Disable auto tuning 1: Request execution of standard type 2: Request execution of low PV type AT		AT
0005$_H$	40006	Word	P	0 to 9999 (0.0 to 999.9%)			P
0006$_H$	40007	Word	I	0 to 32000 (0 to 3200.0 sec)			i
0007$_H$	40008	Word	D	0 to 9999 (0.0 to 999.9 sec)			D
0008$_H$	40009	Word	Hysteresis range at two-position control	0 to 5000 (0.00 to 50.00%FS)		*	HyS
0009$_H$	40010	Word	COOL	0 to 1000 (0.0 to 100.0)			CooL
000A$_H$	40011	Word	Dead band	-5000 to 5000 (-50.00 to +50.00)			db
000B$_H$	40012	Word	Anti-reset windup	0 to 10000 (0.00 to 100.00%)		*	Ar
000C$_H$	40013	Word	Output convergence value	-10000 to 10000 (-100.00 to 100.00%)			bAL
000D$_H$	40014	Word	PV shift	-1000 to 1000 (-10.00 to 10.00%FS)		*	PVOF
000E$_H$	40015	Word	SV offset	-5000 to 5000 (-50.00 to 50.00%FS)		*	SVOF
000F$_H$	40016	Word	Input type code	0 to 16			P-n2
0010$_H$	40017	Word	Temperature unit	0:°C 1:°F			P-F
0011$_H$	40018	Word	Input scale lower limit	-1999 to 9999			P-SL
0012$_H$	40019	Word	Input scale upper limit	-1999 to 9999			P-SU
0013$_H$	40020	Word	Decimal point place¥	0 to 2			P-dP
0014$_H$	40021	Word	(Do not use)				
0015$_H$	40022	Word	Input filter time constant	0 to 9000 (0.0 to 900.0 sec)			P-dF
0016$_H$	40023	Word	RCJ yes/no	0: Disable RCJ compensation (do not perform reference cold junction compensation) 1: Enable RCJ compensation (perform reference cold junction compensation)			rCJ
0017$_H$	40024	Word	MV limit kind	0 to 15			PCUT
0018$_H$	40025	Word	Output 1 lower limit	-300 to 10300 (-3.00 to 103.00%)			PLC1
0019$_H$	40026	Word	Output 1 upper limit	-300 to 10300 (-3.00 to 103.00%)			PHC1
001A$_H$	40027	Word	Output 2 lower limit	-300 to 10300 (-3.00 to 103.00%)			PLC2
001B$_H$	40028	Word	Output 2 upper limit	-300 to 10300 (-3.00 to 103.00%)			PHC2
001C$_H$	40029		(Do not use)				
001D$_H$	40030		(Do not use)				
001E$_H$	40031	Word	Set value (SV) lower limit	0 to 10000 (0.00 to 100.00%FS)		*	SV-L
001F$_H$	40032	Word	Set value (SV) upper limit	0 to 10000 (0.00 to 100.00%FS)		*	SV-H
0020$_H$	40033		(Do not use)				
0021$_H$	40034		(Do not use)				
0022$_H$	40035		(Do not use)				
0023$_H$	40036		(Do not use)				
0024$_H$	40037		(Do not use)				
0025$_H$	40038		(Do not use)				

Relative address	Register No.	Type	Memory contents	Read-out data	Write-in data setting range	Affected by input range	Remarks or corresponding parameter
0026H	40039	Word	Heater burnout alarm set value	0 to 500 （0.0 to 50.0A）			Hb
0027H	40040	Word	Setting lock	0 to 5			LoC
0028H	40041	Word	Alarm 1 type	0 to 34			ALM1
0029H	40042	Word	Alarm 2 type	0 to 34			ALM2
002AH	40043	Word	Alarm 3 type	0 to 34			ALM3
002BH	40044	Word	Alarm 1 set value or alarm 1 lower limit set value	For absolute value alarm　0 to 10000 （0.00 to 100.00%FS） For deviation alarm　-10000 to 10000　（-100.00 to 100.00%FS）		*	AL1 or A1-L
002CH	40045	Word	Alarm 2 set value or alarm 2 lower limit set value			*	AL2 or A2-L
002DH	40046	Word	Alarm 3 set value or alarm 3 lower limit set value			*	AL3 or A3-L
002EH	40047	Word	Alarm 1 upper limit set value	For absolute value alarm　0 to 10000 （0.00 to 100.00%FS） For deviation alarm　-10000 to 10000　（-100.00 to 100.00%FS）		*	A1-H
002FH	40048	Word	Alarm 2 upper limit set value			*	A2-H
0030H	40049	Word	Alarm 3 upper limit set value			*	A3-H
0031H	40050	Word	Alarm 1 hysteresis	0 to 5000 （0.00 to 50.00%FS）		*	A1hy
0032H	40051	Word	Alarm 2 hysteresis			*	A2hy
0033H	40052	Word	Alarm 3 hysteresis			*	A3hy
0034H	40053	Word	Alarm 1 ON-delay set value	0 to 9999 （0 to 9999 sec）			dLy1
0035H	40054	Word	Alarm 2 ON-delay set value				dLy2
0036H	40055	Word	Alarm 3 ON-delay set value				dLy3
0037H	40056		(Do not use)				
0038H	40057	Word	Ramp/soak No. 1 target value	0 to 10000 （0.00 to 100.00%FS, within set value limit)		*	Sv-1
0039H	40058	Word	Ramp/soak No. 2 target value			*	Sv-2
003AH	40059	Word	Ramp/soak No. 3 target value			*	Sv-3
003BH	40060	Word	Ramp/soak No. 4 target value			*	Sv-4
003CH	40061	Word	Ramp/soak No. 5 target value			*	Sv-5
003DH	40062	Word	Ramp/soak No. 6 target value			*	Sv-6
003EH	40063	Word	Ramp/soak No. 7 target value			*	Sv-7
003FH	40064	Word	Ramp/soak No. 8 target value			*	Sv-8
0040H	40065	Word	Ramp/soak No. 1 ramp time	0 to 5999 （0 to 5999 min） * With main unit parameter, ┌Hour┬Min┐ is displayed and set. Therefore, correspondence occurs as: 3601: Data via communication ‖ 6001: Display/setting on main unit			TM1r
0041H	40066	Word	Ramp/soak No. 1 soak time				TM1S
0042H	40067	Word	Ramp/soak No. 2 ramp time				TM2r
0043H	40068	Word	Ramp/soak No. 2 soak time				TM2S
0044H	40069	Word	Ramp/soak No. 3 ramp time				TM3r
0045H	40070	Word	Ramp/soak No. 3 soak time				TM3S
0046H	40071	Word	Ramp/soak No. 4 ramp time				TM4r
0047H	40072	Word	Ramp/soak No. 4 soak time				TM4S
0048H	40073	Word	Ramp/soak No. 5 ramp time				TM5r
0049H	40074	Word	Ramp/soak No. 5 soak time				TM5S
004AH	40075	Word	Ramp/soak No. 6 ramp time				TM6r
004BH	40076	Word	Ramp/soak No. 6 soak time				TM6S
004CH	40077	Word	Ramp/soak No. 7 ramp time				TM7r
004DH	40078	Word	Ramp/soak No. 7 soak time				TM7S
004EH	40079	Word	Ramp/soak No. 8 ramp time				TM8r
004FH	40080	Word	Ramp/soak No. 8 soak time				TM8S
0050H	40081	Word	Ramp/soak mode	0 to 15			MOD
0051H	40082	Word	Ramp/soak command	0: oFF　Ramp/soak stopped 1: rUn　Ramp/soak operated 2: HLd　Ramp/soak halted 3: End　Ramp/soak ended	0: oFF　Stop ramp/soak 1: rUn　Start ramp/soak 2: HLd　Halt ramp/soak		ProG

Relative address	Register No.	Type	Memory contents	Read-out data	Write-in data setting range	Affected by input range	Remarks or corresponding parameter
Note 0052H	40083	Word	Ramp/soak pattern selection	0: Execute No. 1 to 4 ramp/soak (PTn=1) 1: Execute No. 5 to 8 ramp/soak (PTn=2) 2: Execute No. 1 to 8 ramp/soak (PTn=3)			PTn
0053H	40084		(Do not use)				
0054H	40085	Word	PV stable range	0 to 10000 （0.00 to 100.00%FS）		*	SLFb
0055H	40086		(Do not use)				
0056H	40087	Word	Communication DI action request	*② （refer to section 7.4.）			
0057H	40088	Word	Control action type code	0 to 19			P-n1
0058H	40089	Word	Output proportional cycle (output 1)	0: Current output type 1 to 150 （1 to 150 sec） : Relay, SSR drive output type			TC
0059H	40090	Word	Output proportional cycle (output 2)	1 to 150 （1 to 150 sec）			TC2
005AH	40091	Word	(Do not use)				
005BH	40092	Word	Alarm 1 option function				A1op
005CH	40093	Word	Alarm 2 option function	0 to 7 （binary data 000B to 111B）			A2op
005DH	40094	Word	Alarm 3 option function				A3op
005EH	40095	Word	DI1 action setting	0 to 12			di-1
005FH	40096	Word	DI2 action setting	0 to 12			di-2
0060H	40097	Word	Hysteresis mode setting	0: off (main unit parameter setting) 1: on (main unit parameter setting)			ONOF
0061H	40098	Word	(Do not use)				
0062H	40099	Word	User zero adjustment	-5000 to 5000 （-50.00 to 50.00%FS）		*	ADJ0
0063H	40100	Word	User span adjustment	-5000 to 5000 （-50.00 to 50.00%FS）		*	ADJS
0064H	40101	Word	DSP1 (parameter mask designation)	0 to 255			dSP1
0065H	40102	Word	DSP2 (parameter mask designation)	0 to 255			dSP2
0066H	40103	Word	DSP3 (parameter mask designation)	0 to 255			dSP3
0067H	40104	Word	DSP4 (parameter mask designation)	0 to 255			dSP4
0068H	40105	Word	DSP5 (parameter mask designation)	0 to 255			dSP5
0069H	40106	Word	DSP6 (parameter mask designation)	0 to 255			dSP6
006AH	40107	Word	DSP7 (parameter mask designation)	0 to 255			dSP7
006BH	40108	Word	DSP8 (parameter mask designation)	0 to 255			dSP8
006CH	40109	Word	DSP9 (parameter mask designation)	0 to 255			dSP9
006DH	40110	Word	DSP10 (parameter mask designation)	0 to 255			dSP10
006EH	40111	Word	DSP11 (parameter mask designation)	0 to 255			dSP11
006FH	40112	Word	DSP12 (parameter mask designation)	0 to 255			dSP12
0070H	40113	Word	DSP13 (parameter mask designation)	0 to 255			dSP13
0071H	40114	Word	Type of Re-transmission output	0:PV, 1:SV, 2:MV, 3:DV			Ao-T
0072H	40115	Word	Re-transmission output scaling lower limit	-10000 to 10000 （-100.00 to 100.00%）			Ao-L
0073H	40116	Word	Re-transmission output scaling upper limit	-10000 to 10000 （-100.00 to 100.00%）			Ao-H

Relative address	Register No.	Type	Memory contents	Read-out data	Write-in data setting range	Affected by input range	Remarks or corresponding parameter
0074_H	40117	Word	Local/remote operation changeover	0: Local 1: Remote			CMod
0075_H	40118	Word	Remote SV input zero adjustment	-5000 to 5000 (-50 to 50% of input scale)		*	rEM0
0076_H	40119	Word	Remote SV input span adjustment	-5000 to 5000 (-50 to 50% of input scale)		*	rEMS
0077_H	40120	Word	Remote SV input filter time constant	0 to 9000 (0.0 to 900.0 sec)			r-dF

Note） Read-out/write-in data from Register No. 40083 (ramp/soak pattern selection) correspond to parameter "PTn" to be displayed as shown below:

Read-out/write-in data	Parameter PTn	Contents
0	1	1 to 4 ramp/soak executed
1	2	5 to 8 ramp/soak executed
2	3	1 to 8 ramp/soak executed

Word data (read-out only) : Function code [04H]

Relative address	Register No.	Type	Memory contents	Read-out data	Affected by input range	Remarks or corresponding parameter
0000H	30001	Word	Process value (PV)	0 to 10000 （0.00 to 100.00%FS）	*	(Displayed PV value)
0001H	30002	Word	Currently used set value (SV)	0 to 10000 （0.00 to 100.00%FS）	*	(Displayed SV value)
0002H	30003	Word	Currently used deviation (DV)	-10000 to 10000 （-100.00 to 100.00%FS）	*	
0003H	30004	Word	MV (output 1)	-300 to 10300 （-3.00 to 103.00%）		OUT1
0004H	30005	Word	MV (output 2)	-300 to 10300 （-3.00 to 103.00%）		OUT2
0005H	30006	Word	Station No.	0 to 255		STno
0006H	30007	Word	Alarm	*③ (refer to Section 7.4.)		
0007H	30008	Word	Input/main unit abnormal status	*④ (refer to Section 7.4.)		
0008H	30009	Word	Ramp/soak current running position	0 to 17 *⑥ (refer to Section 7.4.)		STAT
0009H	30010	Word	Heater current	0 to 500 （0.0 to 50.0A）		CT
000AH	30011	Word	Timer 1 current count			TM-1
000BH	30012	Word	Timer 2 current count	0 to 9999 （0 to 9999 sec）		TM-2
000CH	30013	Word	Timer 3 current count			TM-3
000DH	30014		(Reserve)			
000EH	30015	Word	DI action status	*⑤ (refer to Section 7.4.)		
0024H	30037	Word	Remotr SV input value	0 to 10000 （0.00 to 100.00%FS）	*	rSV

Notes)

・ For details of * ② to * ⑥ in the table, refer to Section 7.4.

・ The area marked (Do not use) is a reserve area. Do not write in there.

・ Register numbers 30002 (currently used SV) and 40003 (face panel set SV) do not become the same value while switching-SV is active or ramp/soak is under way. (Example: While SV-1 is selected, the value of SV-1 is read out of register number 30002.) For reading out SV for monitoring, use SV in register number 30002.

・

7.3 Address Map of Engineering Unit Data

Data affected by input range is handled in terms of a value (engineering unit) after scaling.

For detailed contents about individual parameter function or setting range, refer to the operation manual (ECNO: 406).

Bit data [read-out/write-in] : Function code [01_H, 05_H, 0F_H]

Relative address	Register No.	Type	Memory contents	Read-out data	Write-in data setting range	Affected by input range	Remarks or corresponding parameter
0000$_H$	00001	Bit	Write in non-volatile memory (FIX execution)	0: Not Writing-in 1: Writing in memory	0: No request 1: Write-in request		(the same function as 41001)

Bit data [read-out only] : Function code [02_H]

Relative address	Register No.	Type	Memory contents	Read-out data	Affected by input range	Remarks or corresponding parameter
0000$_H$	10001	Bit	Alarm 1 ON/OFF	0: Alarm 1 OFF, 1: Alarm 1 ON		
0001$_H$	10002		(Reserve)			
0002$_H$	10003		(Reserve)			
0003$_H$	10004		(Reserve)			
0004$_H$	10005	Bit	Alarm 2 ON/OFF	0: Alarm 2 OFF, 1: Alarm 2 ON		
0005$_H$	10006		(Reserve)			
0006$_H$	10007		(Reserve)			
0007$_H$	10008		(Reserve)			
0008$_H$	10009	Bit	Alarm 1 output (Calculation result of nonexciting alarm)	0: Relay output of alarm 1 OFF 1: Relay output of alarm 1 ON		
0009$_H$	10010	Bit	Alarm 2 output Calculation result of nonexciting alarm)	0: Relay output of alarm 2 OFF 1: Relay output of alarm 2 ON		
000A$_H$	10011	Bit	Alarm 3 output Calculation result of nonexciting alarm)	0: Relay output of alarm 3 OFF 1: Relay output of alarm 3 ON		
000B$_H$	10012	Bit	HB alarm relay output	0: HB alarm output OFF 1: HB alarm output ON		
000C$_H$	10013	Bit	Alarm 1 ON/OFF	0: Alarm 1 OFF, 1: Alarm 1 ON		(Same as 10001)
000D$_H$	10014	Bit	Alarm 2 ON/OFF	0: Alarm 2 OFF, 1: Alarm 2 ON		(Same as 10002)
000E$_H$	10015	Bit	Alarm 3 ON/OFF	0: Alarm 3 OFF, 1: Alarm 3 ON		
000F$_H$	10016	Bit	HB alarm relay output	0:HB alarm output OFF 1:HB alarm output ON		(Same as 10012)

Word data [read-out/write-in]: Function code [03$_H$, 06$_H$, 10$_H$]

Relative address	Register No.	Type	Memory contents	Read-out data	Write-in data setting range	Affected by input range	Remarks or corresponding parameter
03E8$_H$	41001	Word	Non-volatile memory write-in (FIX execution)	0: Not writing in 1: Write in memory	0: No request 1: Request to write in		(Same function as 00001)
03E9$_H$	41002	Word	PID/FUZZY/SELF selection	0: PID control 1: FUZZYcontrol 2: SELF tuning control			CTrL * Inhibit change while controlling
03EA$_H$	41003	Word	SV value controlled on face panel	-1999 to 9999 (within set value limits)		*	
03EB$_H$	41004	Word	Control RUN/standby	0: Invalidate standby (RUN) 1: Validate standby			STby
03EC$_H$	41005	Word	Auto tuning command	0: Auto tuning disabled 1: While executing standard type AT executed 2: While executing low PV type AT executed	0: Disable auto tuning 1: Request execution of standard type 2: Request execution of low PV type AT		AT
03ED$_H$	41006	Word	P	0 to 9999（0.0 to 999.9%）			P
03EE$_H$	41007	Word	I	0 to 32000（0 to 3200.0 sec）			i
03EF$_H$	41008	Word	D	0 to 9999（0.0 to 999.9 sec）			D
03F0$_H$	41009	Word	Hysteresis range at two-position control	0 to 9999 (0 to 50% value of input scale）	*		HyS
03F1$_H$	41010	Word	COOL	0 to 1000（0.0 to 100.0）			CooL
03F2$_H$	41011	Word	Dead band	-5000 to 5000 (-50.00 to +50.00%）			db
03F3$_H$	41012	Word	Anti-reset windup	-1999 to 9999 (0 to 100% value of input scale）	*		Ar
03F4$_H$	41013	Word	Output convergence value	-10000 to 10000 （-100.00 to 100.00%）			bAL
03F5$_H$	41014	Word	PV shift	-1999 to 9999 (-10 to 10% value of input scale）	*		PVOF
03F6$_H$	41015	Word	SV offset	-1999 to 9999 (-50 to 50% value of input scale）	*		SVOF
03F7$_H$	41016	Word	Input type code	0 to 16			P-n2
03F8$_H$	41017	Word	Temperature	0:℃　　　　1:°F			P-F
03F9$_H$	41018	Word	Input scale lower limit	-1999 to 9999			P-SL
03FA$_H$	41019	Word	Input scale upper limit	-1999 to 9999			P-SU
03FB$_H$	41020	Word	Decimal point place	0 to 2			P-dP
03FC$_H$	41021		(Do not use)				
03FD$_H$	41022	Word	Input filter time constant	0 to 9000 (0.0 to 900.0 sec)			P-dF
03FE$_H$	41023	Word	RCJ yes/no	0: Disable RCJ compensation (do not perform reference cold junction compensation) 1: Enable RCJ compensation (perform reference cold junction compensation)			rCJ
03FF$_H$	41024	Word	MV limit kind	0 to 15			PCUT
0400$_H$	41025	Word	Output 1 lower limit	-300 to 10300 (-3.00 to 103.00%)			PLC1
0401$_H$	41026	Word	Output 1 upper limit	-300 to 10300 (-3.00 to 103.00%)			PHC1
0402$_H$	41027	Word	Output 2 lower limit	-300 to 10300 (-3.00 to 103.00%)			PLC2
0403$_H$	41028	Word	Output 21 upper limit	-300 to 10300 (-3.00 to 103.00%)			PHC2
0404$_H$	41029		(Do not use)				
0405$_H$	41030		(Do not use)				
0406$_H$	41031	Word	Set value (SV) lower limit	-1999 to 9999 (within input scale)	*		SV-L
0407$_H$	41032	Word	Set value (SV) upper limit	-1999 to 9999 (within input scale)	*		SV-H
0408$_H$	41033		(Do not use)				
0409$_H$	41034		(Do not use)				
040A$_H$	41035		(Do not use)				

Relative address	Register No.	Type	Memory contents	Read-out data	Write-in data setting range	Affected by input range	Remarks or corresponding parameter
040B$_H$	41036		(Do not use)				
040C$_H$	41037		(Do not use)				
040D$_H$	41038		(Do not use)				
040E$_H$	41039	Word	Heater burnout alarm set value	0 to 500 （0.0 to 50.0A			Hb
040F$_H$	41040	Word	Setting lock	0 to 5			LoC
0410$_H$	41041	Word	Alarm 1 type	0 to 34			ALM1
0411$_H$	41042	Word	Alarm 2 type	0 to 34			ALM2
0412$_H$	41043	Word	Alarm 3 type	0 to 34			ALM3
0413$_H$	41044	Word	Alarm 1 set value or alarm 1 lower limit set value	-1999 to 9999 For absolute value alarm: 0 to 100% value of input scale For deviation alarm: −100 to 100% value of input scale		*	AL1 or A1-L
0414$_H$	41045	Word	Alarm 2 set value or alarm 2 lower limit set value			*	AL2 or A2-L
0415$_H$	41046	Word	Alarm 3 set value or alarm 3 lower limit set value			*	AL3 or A3-L
0416$_H$	41047	Word	Alarm 1 upper limit set value	-1999 to 9999 For absolute value alarm: 0 to 100% value of input scale For deviation alarm: −100 to 100% value of input scale		*	A1-H
0417$_H$	41048	Word	Alarm 2 upper limit set value			*	A2-H
0418$_H$	41049	Word	Alarm 3 upper limit set value			*	A3-H
0419$_H$	41050	Word	Alarm 1 hysteresis	0 to 9999 (0 to 50% value of input scale)		*	A1hy
041A$_H$	41051	Word	Alarm 2. hysteresis			*	A2hy
041B$_H$	41052	Word	Alarm 3. hysteresis			*	A3hy
041C$_H$	41053	Word	Alarm 1 ON-delay set value	0 to 9999 （0 to 9999 sec)			dLy1
041D$_H$	41054	Word	Alarm 2 ON-delay set value				dLy2
041E$_H$	41055	Word	Alarm 3 ON-delay set value				dLy3
041F$_H$	41056		(Do not use)				
0420$_H$	41057	Word	Ramp/soak No. 1 target value	-1999 to 9999 (within set value limit)		*	Sv-1
0421$_H$	41058	Word	Ramp/soak No. 2 target value			*	Sv-2
0422$_H$	41059	Word	Ramp/soak No. 3 target value			*	Sv-3
0423$_H$	41060	Word	Ramp/soak No. 4 target value			*	Sv-4
0424$_H$	41061	Word	Ramp/soak No. 5 target value			*	Sv-5
0425$_H$	41062	Word	Ramp/soak No. 6 target value			*	Sv-6
0426$_H$	41063	Word	Ramp/soak No. 7 target value			*	Sv-7
0427$_H$	41064	Word	Ramp/soak No. 8 target value			*	Sv-8
0428$_H$	41065	Word	Ramp/soak No. 1 ramp time	0 to 5999 （0 to 5999 min) * With main unit parameter, Hour | Min is displayed and set. Therefore, correspondence occurs as: 3601: Data via communication ‖ 6001: Display/setting on main unit			TM1r
0429$_H$	41066	Word	Ramp/soak No. 1 soak time				TM1S
042A$_H$	41067	Word	Ramp/soak No. 2 ramp time				TM2r
042B$_H$	41068	Word	Ramp/soak No. 2 soak time				TM2S
042C$_H$	41069	Word	Ramp/soak No. 3 ramp time				TM3r
042D$_H$	41070	Word	Ramp/soak No. 3 soak time				TM3S
042E$_H$	41071	Word	Ramp/soak No. 4 ramp time				TM4r
042F$_H$	41072	Word	Ramp/soak No. 4 soak time				TM4S
0430$_H$	41073	Word	Ramp/soak No. 5 ramp time				TM5r
0431$_H$	41074	Word	Ramp/soak No. 5 soak time				TM5S
0432$_H$	41075	Word	Ramp/soak No. 6 ramp time				TM6r
0433$_H$	41076	Word	Ramp/soak No. 6 soak time				TM6S
0434$_H$	41077	Word	Ramp/soak No. 7 ramp time				TM7r
0435$_H$	41078	Word	Ramp/soak No. 7 soak time				TM7S
0436$_H$	41079	Word	Ramp/soak No. 8 ramp time				TM8r
0437$_H$	41080	Word	Ramp/soak No. 8 soak time				TM8S
0438$_H$	41081	Word	Ramp/soak mode	0 to 15			MOD

Relative address	Register No.	Type	Memory contents	Read-out data	Write-in data setting range	Affected by input range	Remarks or corresponding parameter
0439H	41082	Word	Ramp/soak command	0: oFF Ramp/soak stopped 1: rUn Ramp/soak operated 2: HLd Ramp/soak halted 3: End Ramp/soak ended	0: oFF Stop ramp/soak 1: rUn Start ramp/soak 2: HLd Halt ramp/soak		ProG
043AH	41083	Word	Ramp/soak pattern selection	0: Execute No. 1 to 4 ramp/soak 1: Execute No. 5 to 8 ramp/soak 2: Execute No. 1 to 8 ramp/soak			PTn
043BH	41084		(Do not use)				
043CH	41085	Word	PV stable range	-1999 to 9999 (Within input scale)		*	SLFb
043DH	41086		(Do not use)				
043EH	41087	Word	Communication DI action request	*② (refer to section 7.4.)			
043FH	41088	Word	Control action type code	0 to 19			P-n1
0440H	41089	Word	Output proportional cycle (output 1)	0: Current output type 1 to 150 （1 to 150 sec）: Relay, SSR drive output type			TC
0441H	41090	Word	Output proportional cycle (output 2)	1 to 150 （1 to 150 sec）			TC2
0442H	41091		(Do not use)				
0443H	41092	Word	Alarm 1 option function	0 to 7 （binary data 000B to 111B）			A1op
0444H	41093	Word	Alarm 2 option function				A2op
0445H	41094	Word	Alarm 3 option function				A3op
0446H	41095	Word	DI1 action setting	0 to 12			di-1
0447H	41096	Word	DI2 action setting	0 to 12			di-2
0448H	41097	Word	Hysteresis mode setting	0: off (main unit parameter setting) 1: on (main unit parameter setting)			ONOF
0449H	41098		(Do not use)				
044AH	41099	Word	User zero adjustment	-1999 to 9999 （-50 to 50% value of input scale）		*	ADJ0
044BH	41100	Word	User span adjustment	-1999 to 9999 （-50 to 50% value of input scale）		*	ADJS
044CH	41101	Word	DSP1 (parameter mask designation)	0 to 255			dSP1
044DH	41102	Word	DSP2 (parameter mask designation)	0 to 255			dSP2
044EH	41103	Word	DSP3 (parameter mask designation)	0 to 255			dSP3
044FH	41104	Word	DSP4 (parameter mask designation)	0 to 255			dSP4
0450H	41105	Word	DSP5 (parameter mask designation)	0 to 255			dSP5
0451H	41106	Word	DSP6 (parameter mask designation)	0 to 255			dSP6
0452H	41107	Word	DSP7 (parameter mask designation)	0 to 255			dSP7
0453H	41108	Word	DSP8 (parameter mask designation)	0 to 255			dSP8
0454H	41109	Word	DSP9 (parameter mask designation)	0 to 255			dSP9
0455H	41110	Word	DSP10 (parameter mask designation)	0 to 255			dSP10
0456H	41111	Word	DSP11 (parameter mask designation)	0 to 255			dSP11
0457H	41112	Word	DSP12 (parameter mask designation)	0 to 255			dSP12
0458H	41113	Word	DSP13 (parameter mask designation)	0 to 255			dSP13

Note

Relative address	Register No.	Type	Memory contents	Read-out data	Write-in data setting range	Affected by input range	Remarks or corresponding parameter
0459$_H$	41114	Word	Type of Re-transmission output.	0:PV, 1:SV, 2:MV, 3:DV			Ao-T
045A$_H$	41115	Word	Re-transmission output scaling lower limit	-10000 to 10000 (-100.00 to 100.00%)			Ao-L
045B$_H$	41116	Word	Re-transmission output scaling upper limit	-10000 to 10000 (-100.00 to 100.00%)			Ao-H
045C$_H$	41117	Word	Local/remote operation changeover	0: Local 1: Remote			CMod
045D$_H$	41118	Word	Remote SV input zero adjustment	-5000 to 5000 (-50 to 50% of input scale)		∗	rEM0
045E$_H$	41119	Word	Remote SV input span adjustment	-5000 to 5000 (-50 to 50% of input scale)		∗	rEMS
045F$_H$	41120	Word	Remote SV input filter time constant	0 to 9000 (0.0 to 900.0 sec)			r-dF

Note) Read-out/write-in data from Register No. 40083 (ramp/soak pattern selection) correspond to parameter "PTn" to be displayed as shown below:

Read-out/write-in data	Parameter PTn	Contents
0	1	1 to 4 ramp/soak executed
1	2	5 to 8 ramp/soak executed
2	3	1 to 8 ramp/soak executed

Word data [read-out only]: Function code [04$_H$,]

Relative address	Register No.	Type	Memory contents	Read-out data	Affected by input range	Remarks or corresponding parameter
03E8$_H$	31001	Word	Process value (PV)	-1999 to 9999 (within input scale)	*	(Displayed PV value)
03E9$_H$	31002	Word	Currently used set value (SV)	-1999 to 9999 (within set value limit)	*	(Displayed SV value)
03EA$_H$	31003	Word	Currently used deviation (DV)	-1999 to 9999 (-100 to 100% value of input scale)	*	
03EB$_H$	31004	Word	MV (output 1)	-300 to 10300 (-3.00 to 103.00%)		OUT1
03EC$_H$	31005	Word	MV (output 2)	-300 to 10300 (-3.00 to 103.00%)		OUT2
03ED$_H$	31006	Word	Station No.	0 to 255		STno
03EE$_H$	31007	Word	Alarm	*③ (refer to Section 7.4.)		
03EF$_H$	31008	Word	Input/main unit abnormal status	*④ (refer to Section 7.4.)		
03F0$_H$	31009	Word	Ramp/soak current running position	0 to 17 *⑥ (refer to Section 7.4.)		STAT
03F1$_H$	31010	Word	Heater current	0 to 500 (0.0 to 50.0A)		CT
03F2$_H$	31011	Word	Timer 1 current count			TM-1
03F3$_H$	31012	Word	Timer 2 current count	0 to 9999 (0 to 9999 sec)		TM-2
03F4$_H$	31013	Word	Timer 3 current count			TM-3
03F5$_H$	31014		(Reserve)			
03F6$_H$	31015	Word	DI action status	*⑤ (refer to Section 7.4.)		
040C$_H$	31037	Word	Remote SV input value	-1999 to 9999	*	rSV

Notes)

・ For details of * ② to * ⑥ in the table, refer to Section 7.4.

・ The area marked (Do not use) is a reserve area.　Do not write in there.

・ Register numbers 31002 (currently used SV) and 40003 (face panel set SV) do not become the same value while switching-SV is active or ramp/soak is under way. (Example: While SV-1 is selected, the value of SV-1 is read out of register number 31002.)　For reading out SV for monitoring, use SV in register number 31002.

7.4 Additional Explanation of Address Map

*②   Register number 40087, 41087 (read-out/write-in area)

Contents of the communication DI action

Used for requesting a DI action via communication.   Once written in, the contents remain held unless the power is turned off or another value is written in.   Pay attention to this point particularly when canceling the alarm latching.

Read-out data is the data which was written in via communication and is different from hardware DI action request data (see * ⑤).   Do not doubly request the action of the same function as hardware DI.

Bit	Contents	Read-out		Write-in	
0	Switching-SV selection	Bit 1 0		Bit 1 0	
1		0 0	While selecting face panel set SV	0 0	While selecting face panel set SV
		0 1	While selecting SV-1	0 1	While selecting SV-1
2	(Reserve)				
3	(Reserve)				
4	(Reserve)				
5	Canceling the alarm 1 latching	0: Not requested to cancel the latching 1: Requested to cancel the latching		0: Not requested to cancel the latching 1: Requested to cancel the latching	
6	Canceling the alarm 2 latching	0: Not requested to cancel the latching 1: Requested to cancel the latching		0: Not requested to cancel the latching 1: Requested to cancel the latching	
7	Canceling the alarm 3 latching	0: Not requested to cancel the latching 1: Requested to cancel the latching		0: Not requested to cancel the latching 1: Requested to cancel the latching	
8	ALM1 relay timer action	0: Timer DI = OFF 1: Timer DI = ON		0: Timer DI = OFF 1: Timer DI = ON	
9	ALM2 relay timer action	0: Timer DI = OFF 1: Timer DI = ON		0: Timer DI = OFF 1: Timer DI = ON	
10	ALM3 relay timer action	0: Timer DI = OFF 1: Timer DI = ON		0: Timer DI = OFF 1: Timer DI = ON	
11	(Reserve)				
12	(Reserve)				
13	(Reserve)				
14	(Reserve)				
15	(Reserve)				

*③   Register numbers 30007, 31007 (read-out only area)

Alarm status contents (bit data, Coil numbers 10009 to 10016 grouped in 1 byte.)

Bit	Contents	Read-out
0	Alarm 1 output (calculation result of de-energizing alarm)	0: Alarm 1 relay output OFF 1: Alarm 1 relay output ON
1	Alarm 2 output (calculation result of de-energizing alarm)	0: Alarm 2 relay output OFF 1: Alarm 2 relay output ON
2	Alarm 3 output (calculation result of de-energizing alarm)	0: Alarm 3 relay output OFF 1: Alarm 3 relay output ON
3	HB alarm relay output	0: HB alarm output OFF 1: HB alarm output ON
4	Alarm 1 ON/OFF	0: Alarm 1 OFF, 1: Alarm 1 ON
5	Alarm 2 ON/OFF	0: Alarm 2 OFF, 1: Alarm 2 ON
6	Alarm 3 ON/OFF	0: Alarm 3 OFF, 1: Alarm 3 ON
7	HB alarm relay output	0: HB alarm output OFF 1: HB alarm output ON

*④   Register numbers 30008, 31008 (read-out only area)

Input/main unit abnormal status

Bit	Contents	Read-out
0	Input Lower open-circuit	0: Lower open-circuit absent 1: Lower open -circuit present
1	Input Upper open-circuit	0: Lower open-circuit absent 1: Lower open -circuit present
2	Input under-range	0: Under-range absent 1: Under-range present
3	Input over-range	0: Over-range absent 1: Over-range present
4	(Reserve)	
5	(Reserve)	
6	Setting range error	0: Setting range normal 1: Setting range abnormal
7	EEPROM error	0: EEPROM normal 1: EEPROM abnormal

*⑤　Register numbers 30015, 31015 (read-out only area)

Contents of DI action status

Hardware DI (DI input terminal) action request information

Bit	Contents	Read-out		
0	Switching-SV selection	Bit	1 0	
1			0 0	Face panel set SV selected
			0 1	SV-1 selected
2	Control RUN/standby	0: Control RUN requested 1: Control standby requested		
3	Auto tuning (standard)	0: AT not requested 1: AT (standard) action requested		
4	Auto tuning (low PV type)	0: AT not requested 1: AT (low PV type) action requested		
5	Canceling the alarm 1 latching	0: Not requested to cancel the latching 1: Requested to cancel the latching		
6	Canceling the alarm 2 latching	0: Not requested to cancel the latching 1: Requested to cancel the latching		
7	Canceling the alarm 3 latching	0: Not requested to cancel the latching 1: Requested to cancel the latching		
8	ALM1 relay timer action	0: Timer DI = OFF 1: Timer DI = ON		
9	ALM2 relay timer action	0: Timer DI = OFF 1: Timer DI = ON		
10	ALM3 relay timer action	0: Timer DI = OFF 1: Timer DI = ON		
11	RUN/RESET selection of ramp/soak	0: Not requested RUN 　（RESET） 1: Requested RUN		
12	(Reserve)			
13	(Reserve)			
14	(Reserve)			
15	(Reserve)			

*⑥   Register numbers 30009, 31009 (read-out only area)

Ramp/soak current running position

Read-out data	Indication of parameter "STAT"	Running position (status)
0	oFF	Stop status of ramp/soak
1	1-rP	No. 1 ramp time
2	1-Sk	No. 1 soak time
3	2-rP	No. 2 ramp time
4	2-Sk	No. 2 soak time
5	3-rP	No. 3 ramp time
6	3-Sk	No. 3 soak time
7	4-rP	No. 4 ramp time
8	4-Sk	No. 4 soak time
9	5-rP	No. 5 ramp time
10	5-Sk	No. 5 soak time
11	6-rP	No. 6 ramp time
12	6-Sk	No. 6 soak time
13	7-rP	No. 7 ramp time
14	7-Sk	No. 7 soak time
15	8-rP	No. 8 ramp time
16	8-Sk	No. 8 soak time
17	End	End status of ramp/soak

8. SAMPLE PROGRAM

This section concerns data read-out/write-in sample program by GW-BASIC*1 which operated on Windows 95[*1] MS-DOS[*1] PROMPT.

Note that the program shown here is for reference for you to create a program and not for guaranteeing all actions. Before executing the program, make sure of the communication conditions in the following procedure.

・ Communication speed (baud rate), data length, stop bits and parity bit:

   Set in this program. Match the conditions with this instrument.

   Note)   Cautions on using SEKISUI's RS232C and RS485 converter unit (SI-30A)

   In SI-30A, send data are received, added to start of the answer data from the slave station.   After cleared data corresponding to the number of sending bytes, treat the remaining data as the answer data in the data receiving process.

   *1:   GW-BASIC, Windows 95 and MS-DOS are registered trademarks of Microsoft Corporation.

(a) Example of data read-out

Operation : Read-out PV, SV (currently used), DV and MV (control output 1) at a time.
(Continuous word read-out from read-out only area)

Used function code : 04H

Read-out start register No. : 31001 (Engineering unit data)

Read-out word number : 4

```
1000 '-------------------------------------------------------
1010 '   READ CONTINUOUS WORDS    SAMPLE PROGRAM
1020 '-------------------------------------------------------
1030 '
1040 '
1050 '
1060 CLS
1070 DIM CC(255)
1080 '
1100 '------------- Send data setting ----------------------
1110 CC(1)=&H01       'Station No.  = 1
1120 CC(2)=&H04       'Function code = 04H
1130 CC(3)=&H03        'Upper byte of relative address(03E8H) of resister No.31001
1140 CC(4)=&HE8        'Lower byte of relative address(03E8H) of resister No.31001
1150 CC(5)=&H00        'Upper byte of read-out word number(0004H)
1160 CC(6)=&H04        'Lower byte of read-out word number(0004H)
1170 COUNT=6
1200 '
1210 '------------- CRC code calculation of send data --------------
1220 GOSUB 3020                        'GOSUB  CRC.CALC
1230 CC(7)=CRC.L       'Lower byte of CRC calculation result -> Upper byte in message
1240 CC(8)=CRC.H       'Upper byte of CRC calculation result -> Lower byte in message
1250 COUNT=COUNT+2
1300 '
1310 '------------- Send data -------------------------------
1320 PRINT "Sending data > ";
1330 OPEN "COM1:9600,o,8,1" AS #1   '9600bps, Odd Parity, Data Length=8, Stop bit=1
1340 FOR I=1 TO COUNT
1350   PRINT #1,CHR$(CC(I));               'Writing in transmission port
1360   PRINT RIGHT$("0"+HEX$(CC(I)),2);" "; 'Displaying on screen
1370 NEXT I
1380 '
1390 FOR I=0 TO 30000 :NEXT I              'Interval time
1500 '
1510 '------------- Data receive ----------------------------
1520 PRINT
1530 LENGTH=LOC(1)                         'Number of data in receiving buffer
1540 IF LENGTH=0 THEN PRINT "No answer" :END
1550 PRINT "Receiving data < ";
1560 FOR I=1 TO LENGTH
1570   X$=INPUT$(1,#1)                     'Taking data from receiving buffer
1580   CC(I)=ASC(X$)                       'Digitizing and storing
1590   PRINT RIGHT$("0"+HEX$(CC(I)),2);" "; 'Displaying on screen
1600 NEXT I
1610 CLOSE #1
1620 COUNT=LENGTH-2
1630 GOSUB 3020                            'GOSUB  CRC.CALC
1700 '
1710 '------------- Transmission error check ----------------------
1720 PRINT
```

```
1730 CRC.L$=RIGHT$("0"+HEX$(CRC.L),2)
1740 CRC.H$=RIGHT$("0"+HEX$(CRC.H),2)
1750 PRINT "CRC calculation = ";CRC.L$;" ";CRC.H$
1760 IF CC(LENGTH-1)<>CRC.L THEN GOTO 1790    'GOTO ER.MESSAGE
1770 IF CC(LENGTH)<>CRC.H THEN GOTO 1790      'GOTO ER.MESSAGE
1780 GOTO 1920                                'GOTO PRT.RESULT
1790 'ER.MESSAGE
1800  PRINT "Communication error"
1810 END
1900 '
1910 '------------ Display of result -------------------------
1920 'PRT.RESULT
1930 ' In case of decimal point position(P-dP)=1
1940  PRINT
1950 PV$=HEX$(CC(4))+RIGHT$("0"+HEX$(CC(5)),2)     '2 bytes -> 1 word
1960 SV$=HEX$(CC(6))+RIGHT$("0"+HEX$(CC(7)),2)     '2 bytes -> 1 word
1970 DV$=HEX$(CC(8))+RIGHT$("0"+HEX$(CC(9)),2)     '2 bytes -> 1 word
1980 MV$=HEX$(CC(10))+RIGHT$("0"+HEX$(CC(11)),2)   '2 bytes -> 1 word
1990  PRINT "PV =";VAL("&H"+PV$)/10;"degree C"     '1 place of decimal
2000  PRINT "SV =";VAL("&H"+SV$)/10;"degree C"     '1 place of decimal
2010  PRINT "DV =";VAL("&H"+DV$)/10;"degree C"     '1 place of decimal
2020  PRINT "MV1=";VAL("&H"+MV$)/100;"%"           'MV is data of 2 places of decimal
2030 END
3000 '
3010 '----------- CRC calculation ----------------------------
3020 'CRC.CALC            'For contents, refer to  CRC calculation flow chart
3030  CR=&HFFFF
3040  FOR I=1 TO COUNT
3050   CR=CR XOR CC(I)
3060   FOR J=1 TO 8
3070     CT=CR AND &H1
3080    IF CR<0 THEN CH=1 ELSE CH=0:GOTO 3100     'GOTO CRC.CALC.10
3090     CR=CR AND &H7FFF
3100    'CRC.CALC.10
3110     CR=INT(CR/2)
3120     IF CH=1 THEN CR=CR OR &H4000
3130     IF CT=1 THEN CR=CR XOR &HA001
3140   NEXT J
3150  NEXT I
3160  CRC.L=CR AND &HFF                          'Lower byte of CRC calculation
3170  CRC.H=((CR AND &HFF00)/256 AND &HFF)       'Upper byte of CRC calculation
3180 RETURN
```

(b) Data write-in example

Operation : Start ramp/soak of No. 1 station via communication

(Single word write-in)

Used function code   : 06H

Write-in register No.   : 41082 (Table of engineering unit data)

Write-in data   : 1 (Ramp/soak start)

```
1000 '------------------------------------------------------
1010 '   WRITE CONTINUOUS WORDS    SAMPLE PROGRAM
1020 '------------------------------------------------------
1030 '
1040 '
1050 '
1060 CLS
1070 DIM CC(255)
1080 '
1100 '------------- Send data setting ----------------------
1110 CC(1)=&H01        'Station No.  = 1
1120 CC(2)=&H06        'Function code = 06H
1130 CC(3)=&H04         'Upper byte of relative address(0439H) of resister No.41082
1140 CC(4)=&H39         'Lower byte of relative address(0439H) of resister No.41082
1150 CC(5)=&H00         'Upper byte of write-in word data(0001H)
1160 CC(6)=&H01         'Lower byte of write-in word data(0001H)
1170 COUNT=6
1200 '
1210 '------------- CRC code calculation of send data --------------
1220 GOSUB 3020                        'GOSUB  CRC.CALC
1230 CC(7)=CRC.L      'Lower byte of CRC calculation result -> Upper byte in message
1240 CC(8)=CRC.H      'Upper byte of CRC calculation result -> Lower byte in message
1250 COUNT=COUNT+2
1300 '
1310 '------------- Send data ----------------------------
1320 PRINT "Sending data > ";
1330 OPEN "COM1:9600,o,8,1" AS #1  '9600bps, Odd Parity, Data Length=8, Stop bit=1
1340 FOR I=1 TO COUNT
1350   PRINT #1,CHR$(CC(I));              'Writing in transmission port
1360   PRINT RIGHT$("0"+HEX$(CC(I)),2);" "; 'Displaying on screen
1370 NEXT I
1380 '
1390 FOR I=O TO 30000 :NEXT I            'Interval time
1500 '
1510 '------------- Data receive --------------------------
1520 PRINT
1530 LENGTH=LOC(1)                         'Number of data in receiving buffer
1540 IF LENGTH=0 THEN PRINT "No answer" :END
1550 PRINT "Receiving data < ";
1560 FOR I=1 TO LENGTH
1570   X$=INPUT$(1,#1)                     'Taking data from receiving buffer
1580   CC(I)=ASC(X$)                       'Digitizing and storing
1590   PRINT RIGHT$("0"+HEX$(CC(I)),2);" "; 'Displaying on screen
1600 NEXT I
1610 CLOSE #1
1620 COUNT=LENGTH-2
1630 GOSUB 3020                          'GOSUB  CRC.CALC
1700 '
1710 '------------- Transmission error check ----------------------
1720 PRINT
```

```
1730 CRC.L$=RIGHT$("0"+HEX$(CRC.L),2)
1740 CRC.H$=RIGHT$("0"+HEX$(CRC.H),2)
1750 PRINT "CRC calculation = ";CRC.L$;" ";CRC.H$
1760 IF CC(LENGTH-1)<>CRC.L THEN GOTO 1790  'GOTO  ER.MESSAGE
1770 IF CC(LENGTH)<>CRC.H THEN GOTO 1790    'GOTO  ER.MESSAGE
1780 GOTO 1920                              'GOTO  PRT.RESULT
1790 'ER.MESSAGE
1800  PRINT "Communication error"
1810 END
1900 '
1910 '------------- Display of result --------------------------
1920 'PRT.RESULT
1930  PRINT
1940  PRINT "Completion of ramp/soak start-up"
1950 END
3000 '
3010 '------------ CRC calculation  -----------------------------
3020 'CRC.CALC            'For contents, refer to  CRC calculation flow chart
3030 CR=&HFFFF
3040 FOR I=1 TO COUNT
3050  CR=CR XOR CC(I)
3060  FOR J=1 TO 8
3070    CT=CR AND &H1
3080   IF CR<0 THEN CH=1 ELSE CH=0:GOTO 3100     'GOTO  CRC.CALC.10
3090    CR=CR AND &H7FFF
3100   'CRC.CALC.10
3110    CR=INT(CR/2)
3120    IF CH=1 THEN CR=CR OR &H4000
3130    IF CT=1 THEN CR=CR XOR &HA001
3140  NEXT J
3150 NEXT I
3160 CRC.L=CR AND &HFF                     'Lower byte of CRC calculation
3170 CRC.H=((CR AND &HFF00)/256 AND &HFF)  'Upper byte of CRC calculation
3180 RETURN
```

9. TROUBLESHOOTING

If the communication is unavailable, check the following items.

☐   Whether all devices related to communication are turned on.

☐   Whether connections are correct.

☐   Whether the number of connected instruments and connection distance are as specified.

☐   Whether communication conditions coincide between the master station (host computer) and slave stations (PXR).

    ☐   Transmission speed   :   9600bps

    ☐   Data length   :   8 bits

    ☐   Stop bit   :   1 bit

    ☐   Parity   :   ☐odd

                            ☐even

                            ☐none

☐   Whether send/receive signal timing conforms to Section 5.4 in this manual.

☐   Whether the station No. designated as send destination by the master station coincides with the station No. of the connected PXR

☐   Whether more than one instrument connected on the same transmission line shares the same station No.

☐   Whether the station No. of instruments is set at other than 0.

    If it is 0, the communication function does not work.

☐   Whether the 11th digit of type cord of this controller is M or V?

$$(PXR4\square\square\square\square - \square\square\,{}^{M}_{V}\,\square\square - \square)$$